Pink Salmon Hatchery Proportions in Selected Lower Cook Inlet Commercial Fisheries, 2015–2018

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ADF&G-Commercial Fisheries, Homer
Lower Cook Inlet Management Area
LCI Pink Salmon Hatcheries

**Tutka Bay Lagoon Hatchery (TBLH)**
- Permitted for 125 million pink salmon eggs
- Brood Stock: Tutka Lagoon Creek
- Annual pink releases of 320K (1977) – 105 million (1996); Avg. release 42.4 million
- Dormant 2004-2011
- 100% of pink salmon thermally marked beginning in 2012

**Port Graham Hatchery (PGH)**
- Permitted for 125 million pink salmon eggs
- Brood Stock: Port Graham River
- Annual pink releases of 358K (1995) – 57.2 million (2003); Avg. release: 11.5 million
- Dormant 2007–2014
- 100% of pink salmon thermally marked

Photo Credit: CIAA
Protection of Wild Stocks

• Private Non-Profit Hatchery Act (1974)
• ADF&G Genetics Policy (Davis et al. 1985; Davis and Burkett 1989)
• Mixed Stock Salmon Fishery Policy (5 AAC 39.220)
• Sustainable Salmon Fishery Policy (5 AAC 39.222)
• Salmon Escapement Goal Policy (5 AAC 39.223)

Purpose of LCI Study

Gather baseline data on the hatchery-wild composition of harvests and escapements in LCI as 2 recently reopened hatcheries began releasing marked fry.
Objectives:

1. Estimate hatchery-wild composition of the commercial harvest
   a. Hatchery cost-recovery targets hatchery fish
   b. Hatchery contribution to the common property harvest

2. Monitor escapements to pink salmon index streams in the Southern and Outer districts
   a. Are we making our escapement goals?
Study Design

**Catch Sampling Goals**
- **Sample directly from seiners**
  - get precise harvest locations
- **Sample wherever harvest occurs**
  - inside/outside hatchery SHAs
- **Sample 1-2 days per week**
- **96 otoliths per sample**
- Tender operators kept set gillnet harvests separated by subdistrict
- Otoliths read 1x by ADF&G staff in Cordova

**Escapement Monitoring**
- Ground or aerial surveys of index streams with escapement goals
- Included streams inside hatchery SHAs and up to 40 miles away
- Survey ~1x per week thru run
- Use area-under-the-curve (AUC) method to convert periodic survey counts into an escapement index
- Compared escapements to goals

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Results

• **Objective 1: Harvest Composition**
  a. Estimate hatchery composition of cost-recovery harvest
  b. Determine hatchery composition of common property harvest

• **Objective 2: Escapement Monitoring**
  – Did streams achieve their escapement goals?
Hatchery Composition of the Cost Recovery Harvest Samples

Inside Tutka Lagoon (98.7%)
- 9-Jul-15: 100% Hatchery
- 15-Jul-15: 96.2% Hatchery
- 7-Jul-16: 100% Hatchery

Outside Tutka Lagoon
- 23-Jul-15: 95.1% Hatchery
- 15-Jul-15: 96.2% Hatchery
- 23-Jul-18: 92.1% Hatchery

Tutka Hatchery SHA (241-07)
- 99.6% Tutka Hatchery
- 0.4% PWS Hatcheries

Hatchery IDs (marked fish):
- 99.6% Tutka Hatchery
- 0.4% PWS Hatcheries
Hatchery Composition of the Cost Recovery Harvest Samples

Port Graham Subdistrict (241-20)

Hatchery Marks (2016–18):
- Hatchery Cost-Recovery: 86.3%
- Common Property: 16.1–56.3%

Hatchery IDs (Cost-Recovery):
- 94.2% Port Graham Hatchery
- 4.3% Tutka Hatchery
- 1.4% PWS Hatcheries

Legend:
- Orange: 2016
- Red: 2017
- Green: 2018
Hatchery Contribution of the Common Property Harvest Samples

Hatchery Composition of CCP Catch:
Overall Average: 59.6% (0–99%); n=53 samples, 4,277 fish
Purse Seine Avg: 62.3% (0–99%); n= 45 samples, 3,514 fish
SGN Avg: 44.8% (22–80%); n= 8 samples, 763 fish

Hatchery IDs (marked fish):
90.8% Tutka Hatchery
6.2% Port Graham Hatchery
3.0% PWS Hatcheries

Legend
- 0% - 20%
- 21% - 40%
- 41% - 59%
- 60% - 79%
- 80% - 99%

Map showing distribution of hatchery contributions.
<table>
<thead>
<tr>
<th>#</th>
<th>Index Stream</th>
<th>Esc. Goal</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Humpy Creek</td>
<td>17,500-51,400</td>
<td>38,025</td>
<td>89,673</td>
<td>71,073</td>
<td>54,816</td>
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<tr>
<td>2</td>
<td>China Poot Creek</td>
<td>2,500-6,300</td>
<td>7,366</td>
<td>698</td>
<td>2,379</td>
<td>2,280</td>
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<tr>
<td>3</td>
<td>Tutka Lagoon Creek</td>
<td>6,500-17,000</td>
<td>81,584</td>
<td>33,242</td>
<td>61,369</td>
<td>60,691</td>
</tr>
<tr>
<td>4</td>
<td>Barabara Creek</td>
<td>2,000-5,600</td>
<td>25,203</td>
<td>2,813</td>
<td>25,002</td>
<td>7,236</td>
</tr>
<tr>
<td>5</td>
<td>Seldovia Creek</td>
<td>21,800-37,400</td>
<td>108,793</td>
<td>15,694</td>
<td>27,025</td>
<td>50,827</td>
</tr>
<tr>
<td>6</td>
<td>Port Graham River</td>
<td>7,700-19,700</td>
<td>82,356</td>
<td>14,629</td>
<td>20,642</td>
<td>33,419</td>
</tr>
<tr>
<td>7</td>
<td>Dogfish Lagoon Creeks</td>
<td>800-7,100</td>
<td>50,058</td>
<td>2,307</td>
<td>13,331</td>
<td>8,398</td>
</tr>
<tr>
<td>8</td>
<td>Port Chatham Creeks</td>
<td>7,800-18,100</td>
<td>42,613</td>
<td>1,140</td>
<td>44,291</td>
<td>18,122</td>
</tr>
<tr>
<td>9</td>
<td>Windy Creeks</td>
<td>8,800-38,300</td>
<td>50,649</td>
<td>1,900</td>
<td>22,434</td>
<td>22,968</td>
</tr>
<tr>
<td>10</td>
<td>Rocky River</td>
<td>11,700-54,800</td>
<td>107,931</td>
<td>4,300</td>
<td>31,189</td>
<td>2,008</td>
</tr>
</tbody>
</table>
Conclusions

• > 95% of pink salmon collected from cost-recovery harvests in SHAs were hatchery marked (n=577)

• Hatcheries contributed substantially to the samples from common property pink salmon harvest in the Southern District:
  – ~62% of CCP seine samples were marked (n=3,514);
  – ~45% of CCP SGN samples were marked (n=763)

• Pink salmon index streams consistently met their escapement goals despite increased harvest effort on hatchery pink salmon

• Escapement to most wild stock index streams included hatchery marked fish
Thermally Marked Pink Salmon in Selected Lower Cook Inlet streams, 2014–2018

Glenn Hollowell and Ted Otis
ADF&G-Commercial Fisheries, Homer
Project Goal(s)

1.) In 2014 the *initial* project goals were to determine the percentage of strays of Tutka and Port Graham hatchery produced pink salmon in select streams,
Project Goal(s)

1.) In 2014 the *initial* project goals were to determine the percentage of strays or Tutka hatchery produced pink salmon in select streams,

2.) Provide information to Department staff regarding levels of strayed LCI fish for use in managing the Tutka and Port Graham hatcheries to minimize straying and impacts to wild pink salmon. Primarily this would be through the Cook Inlet Area Regional Planning Team. This group is tasked with overseeing hatchery operations in the Lower Cook Inlet area, and advising the F&G Commissioner regarding hatchery operations.
Lower Cook Inlet
Pink Salmon
Straying Study Streams
2014-2018
Methods

- Streams were visited throughout the run timing,
- Ideally 96 otoliths from each stream on each visit, with at least two samples collected each summer,
- Otoliths were only collected from spawned out carcasses,
- Ideally carcasses were sampled throughout the drainage
Levels of LCI hatchery marked pink salmon otoliths
2014 – 2018

average of percents of marked otoliths in samples for each of the years sampled

Barabara Ck.
3.5%
(1.0% - 5.3%)
n=5  LCI

Seldovia R.
6.2%
(0.0% - 22.5%)
n=5  LCI

Tutka Lagoon Ck.
91.3%
(86.1% - 94.9%)
n=5  LCI

Port Dick Ck.
0.8%
(0.0% - 2.2%)
n=4  LCI

Island Ck.
1.0%
(0.0% - 2.9%)
n=4  LCI

Humpy Ck.
0.4%
(0.0% - 1.6%)
n=5  LCI

English Bay
4.7%
(0.0% - 14.3%)
n=5  LCI

Port Graham Hatchery

Tutka Hatchery

Dogfish Lagoon
7.8%
(0.0% - 15.3%)
n=5  LCI

Pt Graham River
14.9%
(1.1% - 45.8%)
n=5  LCI

Hollowell and Otis

2019 BOF
Levels of LCI marked otoliths sampled outside of hatchery special harvest areas (SHAs), and release size for that returning year class of pink salmon.
Levels of PWS hatchery marked pink salmon otoliths in samples (excluding SHAs) 2014 - 2018

- Barabara Ck.: 27.4% (2.0% - 87.4%) n=5 PWS
- China Poot Ck.: 3.7% (0.0% - 10.6%) n=5 PWS
- English Bay R.: 22.3% (7.7% - 33.3%) n=5 PWS
- Humpy Ck.: 0.8% (0.0% - 1.6%) n=5 PWS
- Island Ck.: 10.5% (0.0% - 19.9%) n=4 PWS
- Pl. Graham Ck.: 4.8% (0.0% - 15.6%) n=4 PWS
- Port Dick Ck.: 4.2% (0.0% - 11.5%) n=4 PWS
- Seldovia R.: 5.2% (0.0% - 12.5%) n=5 PWS
- Tutka Lagoon Ck.: 2.0% (0.0% - 7.0%) n=4 PWS
- Dogfish Lagoon: 21.0% (4.2% - 52.3%) n=5 PWS

Average of percents of marked otoliths in samples for each of the years sampled.

Sample site X.X% (percent range) years sampled mark.
Levels of PWS and LCI marked pink salmon otoliths in samples, 2014 - 2018

sample site
X.X% (percent range)
years sampled mark

average of percents of marked otoliths in samples for each of the years sampled

Seldovia R.
5.2% (0.0% - 12.5%) PWS
3.5% (1.0% - 5.3%) LCI

Barabara Ck.
27.4% (2.0% - 87.4%) PWS

Pl. Graham Ck.
4.8% (0.0% - 15.6%) PWS
14.9% (1.1% - 45.8%) LCI

English Bay R.
22.3% (7.7% - 33.3%) PWS
4.7% (0.0% - 14.3%) LCI

Tutka Lagoon Ck.
2.0% (0.0% - 7.0%) PWS
91.3% (66.1% - 94.9%) LCI

Port Dick Ck.
4.2% (0.0% - 11.5%) PWS
0.8% (0.0% - 2.2%) LCI

Island Ck.
10.5% (0.0% - 19.9%) PWS
1.0% (0.0% - 2.9%) LCI

Humpy Ck.
0.8% (0.0% - 1.8%) PWS
0.4% (0.0% - 1.8%) LCI

0.4% (0.0% - 1.8%) LCI

1.0% (0.0% - 2.1%) LCI

Tutka Hatchery

Port Graham Hatchery
Levels of PWS and LCI marked pink salmon otoliths in samples, 2014 - 2018

Sample site: X.X% (percent range) years sampled mark average of percents of marked otoliths in samples for each of the years sampled.

- **Beluga Slough**: 57.0% PWS, 1.4% LCI
- **Lou's Ck.**: 49.5% PWS, 13.7% LCI
- **Pt Chatham**: 24.7% PWS (1.5% - 47.9%), 8.3% LCI (0.0% - 16.6%)
- **Fritz Ck.**: 70.5% PWS, 0.0% LCI
- **Sadie Cove**: 15.1% PWS, 4.3% LCI
- **Tulka Headend**: 5.6% PWS (5.2% - 6.0%), 56.1% LCI (35.0% - 77.1%)
- **McNeil River**: 0.0% PWS, 2.1% LCI
- **Port Graham Hatchery**:
- **Nuka Bay**: 6.3% PWS, 2.1% LCI
Findings

Box and whisker plots showing percent occurrence of PWS and LCI hatchery marked otoliths in samples from pink salmon carcasses in LCI streams excluding hatchery special harvest areas, 2014-2018. Bottom and top of the box are 25th and 75th percentile. Horizontal line in the box is the 50th percentile, (median). Circle is the mean, (average).
Conclusions

• Lower Cook Inlet produced pink salmon are present in streams
  – sampled at a lower than expected level

• Prince William Sound hatchery pink salmon are present in LCI collected samples.
  – not expected when study was conceived

• Interpretation of current data set is limited given small number of years sampled.
  – need to continue sampling based on a comprehensive study design
Questions?